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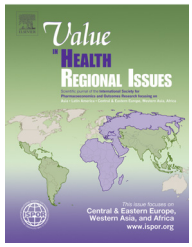

An Audit of Diabetes-Dependent Quality of Life (ADDQOL) in Older Patients with Diabetes Mellitus Type 2 in Slovenia

Eva Turk, MA, MBA[1,*], *Valentina Prevolnik Rupel, PhD*[2], *Alojz Tapajner, BSc*[3], *Stephen Leyshon, RN, MSc*[1], *Arja Isola, RN, PhD*[4]

[1]*Det Norske Veritas, Healthcare & Biorisk, DNV Research and Innovation, Høvik, Norway;* [2]*Institute for Economic Research, Ljubljana, Slovenia;* [3]*Faculty of Medicine, University of Maribor, Maribor, Slovenia;* [4]*Faculty of Medicine, Institute of Health Sciences, University of Oulu, Oulu, Finland*

ABSTRACT

Objective: This article reports a study to measure diabetes-dependent quality of life (QOL) in older Slovenian patients with diabetes mellitus type 2 (DMT2). **Methods:** A cross-sectional study of older (age ≥ 65 years) patients with DMT2 at outpatient diabetic centers was conducted in all regions in Slovenia. The Audit of Diabetes-Dependent Quality of Life questionnaire was carried out between January and May 2012. Statistical analysis was performed by using IBM SPSS Statistics software, version 18.0. **Results:** After exclusion of noneligible respondents, a total of 285 respondents were included in the analysis, which represented a 57% response rate. Lower QOL was significantly connected to a heart attack episode (odds ratio 2.42; 95% confidence interval 1.06–5.20) and to the perception of not having diabetes under control (odds ratio 0.36; 95% confidence interval 0.18–0.69). Eleven (3.9%) patients reported no impact of DMT2 on their QOL at all, while in the remaining respondents, particular reference was put to the effects on freedom to eat, dependency on others, and family life. There was no significant difference between the older people living in urban and rural areas. **Conclusions:** The findings of the present study highlight the impact of DMT2 on QOL. DMT2 imposes a personal burden on individuals. Information on the QOL of older patients with diabetes is important to Slovenian policymakers and family physicians to identify and implement appropriate interventions for achieving better management of diabetes and ultimately improving the QOL of patients with diabetes.

Keywords: ADDQOL, DMT2, elderly, patient-reported outcomes, quality of life.

Introduction

Diabetes is a chronic metabolic disease that can have a profound impact on the health status and quality of life (QOL) of patients in terms of physical, social, and psychological well-being [1–3]. Diabetes is now a global health concern: affecting both industrialized and transitioning countries. The number of people with diabetes is increasing because of population growth, aging, urbanization, and increasing prevalence of obesity and physical inactivity. Diabetes mellitus (DM) currently affects about 285 million adults worldwide, and it is projected to rise to 366 million in 2030 [4,5]. The most important demographic change to diabetes prevalence across the world appears to be the increase in the proportion of people aged 65 years or older [4]. In Europe alone, more than 50 million individuals are affected by diabetes, 90% of whom have diabetes mellitus type 2 (DMT2) [6].

Slovenia does not differ significantly from other European Union countries with regard to the prevalence of diabetes. The estimates of the National Institute of Public Health [7] amount to approximately 125,000 patients with diabetes in Slovenia, which is 6.3% of the population. Of these, 22.2% are aged 75 years or older, and 16% are aged between 65 and 74 years, with the mean age of patients with DMT2 being 65 years. Similarly, as in the rest of Europe, the population in Slovenia is ageing and population health improvement is an increasingly important component of coordination and collaboration among patients and health care providers [8,9].

Internationally, there has been a marked shift in thinking about what health is and how it is measured [10]. Traditional clinical ways of measuring health and the effects of treatment are either accompanied by or even replaced by patient-reported outcome measures (PROMs), which present an entirely subjective report of the status of a patient's health condition. Research has shown that patients with diabetes are more concerned about physical and social function, emotional and mental health, as well as the burden of illness and treatments on daily life than with clinical biomarkers such as hemoglobin A_{1c}, blood pressure, or lipid levels [11,12]. PROMs are thus meaningful and relevant outcomes. Furthermore, there is evidence that when the health-related quality of life (HRQOL) of individuals with diabetes is properly measured and the results are incorporated into health care management, improvements in patient outcomes occur [13,14]. Improvements in glycemic control and QOL, as well as reduction in short-term complications including the incidence of severe hypoglycemia, can be observed in combination of treatment and education of patients [15–17].

Conflict of interest: The authors have indicated that they have no conflicts of interest with regard to the content of this article.

* *Address correspondence to:* Eva Turk, Healthcare Programme, DNV Research and Innovation, Veritasveien 1, 1322 Høvik, Norway. E-mail: eva.turk@gmail.com.

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Many valid instruments to measure PROMs in diabetes have been developed and are already used in industrialized countries [18–20]. Among diabetes-dependent QOL measures, the Audit of Diabetes-Dependent Quality of Life (ADDQOL) is a widely used instrument [21–24]. In Slovenia, however, despite the high prevalence of diabetes, so far no studies evaluating patient-reported outcomes, such as HRQOL, have been conducted. According to the literature, less research was conducted on how various risk factors influence the QOL of patients with diabetes [25–27]. In this manner, the objective of the current study was to measure diabetes-dependent QOL in the older Slovenian patients with DMT2 and to assess its relationships with sociodemographic and health factors.

Methods

Instrument

The ADDQOL consists of two overview items; one measures generic overall QOL and a further 19 items are concerned with the impact of diabetes on specific aspects of life. The 19 life domains are as follows: leisure activities, working life, local or long-distance journeys, holidays, physical health, family life, friendships and social life, close personal relationships, sex life, physical appearance, self-confidence, motivation to achieve things, people's reactions, feelings about the future, financial situation, living conditions, dependence on others, freedom to eat, and freedom to drink. These 19 domains ask the respondents to evaluate how their life would be if they did not have diabetes.

The scales range from −3 to +1 for 19 life domains (impact rating) and from 0 to +3 in attributed importance (importance rating). A weighted score for each domain is calculated as a multiplier of impact rating and importance rating (ranging from −9 to +3). Lower scores reflect poorer QOL. Finally, a mean weighted impact score (ADDQOL score) is calculated for the entire scale across all applicable domains [21,23,28]. Apart from the perceived QOL, data on patients' demographic characteristics, duration of diabetes, and existing diabetic complications were measured. The linguistic validation and cultural adaptation of the original English ADDQOL into Slovenian version is described elsewhere (E. Turk, V. Prevolnik-Rupel, A. Tapajner, et al., unpublished data, 2013).

Study Design and Participants

A cross-sectional study was conducted between January and May 2012 by using a structured questionnaire.

Patients from the 12 participating outpatient diabetic centers were recruited by using the convenience sampling method. The regions selected were defined by the Statistical office of the Republic of Slovenia (E. Turk, V. Prevolnik-Rupel, A. Tapajner, et al., unpublished data, 2013). For recruitment, we used the largest outpatient center in each region in consideration that patients were approximately half from urban and rural areas. Each outpatient center recruited from 20 to 80 patients according to region size and diabetes prevalence [29]. All the study patients had an established relationship with the outpatient centers. Patients who met our inclusion criteria were asked to participate in this study. The inclusion criteria were as follows: physician-diagnosed DMT2, noninsulin treatment, and age 65 years or older. Patients who were diagnosed as suffering from type 1 diabetes, secondary diabetes, or gestational diabetes were excluded. All patients were diagnosed by physicians in light of diagnostic criteria recommended by the World Health Organization in 1999 [31].

A total of 500 patients with DMT2 were invited to participate in the research. Of them, 391 agreed and after exclusion of incomplete questionnaires, our sample included 285 patients with DMT2. The response rate was 57%.

After informed consent was obtained, all prospective participants were given the questionnaire. Where assistance was needed in completing the questionnaire, this was given by medical students, who were trained in the use of the ADDQOL questionnaire prior to the launch of this study.

Ethical Considerations

The study was approved by the National Medical Ethics Committee of the Republic of Slovenia. The data obtained through the questionnaires were anonymous and based on participant consent.

Statistical Analysis

The sample data were expressed as frequencies and percentages for categorical variables or by mean values and SDs for continuous variables. Binary logistic regression analysis was used to assess the influence of sociodemographic and health characteristics of patients with DMT2 on their QOL by using the ADDQOL. The calculation included Wald chi-square, odds ratio (OR), 95% confidence interval (95% CI), and P value. Nagelkerke's R^2 was used to indicate goodness of fit. Patients were divided into two groups by using the ADDQOL score by using quartiles; the first group in the lower quartile was considered as having lower QOL. Such a cutoff strategy was previously applied in the literature [26,31]. Statistical analysis was performed with the SPSS 18.0 software (SPSS, Inc., Chicago, IL). A P value of less than 0.05 was considered statistically significant.

Results

Sociodemographic characteristics of the studied population are presented in Table 1. The age ranged from 65 to 84 years, with a mean of 70.0 ± 4.9 years. Among the 285 respondents, less than half were female (135, 47.4%). The majority of the respondents were married (191; 67.0%), owned their own house (171; 60.0%), and lived in an urban area (243; 85.3%).

The body mass index (kg/m^2) ranged from 16.9 to 53.0, with a mean value of 29.6 ± 5.0. A majority of the respondents have been living with DMT2 for 11 years or more (56.5%), and many had problems with hypertension (78.9%) and high cholesterol (59.6%). More details about respondents' health characteristics are shown in Table 2. A vast majority of the respondents (230, 80.7%) reported to be satisfied with professional health support provision, and 114 (40.0%) were of the opinion that their diabetes was under control.

The ADDQOL score of 285 patients with DMT2 was calculated in a range of −8.3 to 0.0 on a defined range from −9 to +3. The median ADDQOL score was calculated at −1.6, lower quartile cutoff was calculated at −3.0, 213 (74.7%) patients with DMT2 reported an ADDQOL score of −3.0 or more, and 72 (25.3%) patients had an ADDQOL score of less than −3.0 (lower QOL). Eleven patients (3.9%) reported an ADDQOL score of 0, which means that their QOL was not affected by diabetes at all.

Table 3 shows the logistic regression model results of the predictors of QOL according to the ADDQOL score. Lower QOL was significantly connected to a heart attack episode (OR 2.42; 95% CI 1.06–5.20). From a patient perspective, being of the opinion that their diabetes was under control decreased the likelihood of a lower QOL (OR 0.36; 95% CI 0.18–0.69). Living in a rural environment was not significantly connected to a lower QOL. Results in Figure 1 show that only 13.6% of the patients without heart attack

Table 1 – Sample data.

	N = 285	%
Gender		
Male	150	52.6
Female	135	47.4
Education		
Primary education	87	30.5
Secondary education	163	57.2
College or higher	35	12.3
Marital status		
Married, in partnership	191	67.0
Widowed	71	24.9
Divorced	11	3.9
Alone	12	4.2
Residence		
Own house	171	60.0
Own apartment	92	32.3
Renting	11	3.9
Relatives	8	2.8
Nursing home	3	1.1
Monthly income in euro		
≤365	36	12.6
366–730	162	56.8
731–1100	60	21.1
≥1101 or above	27	9.5
Region		
≤200 per km^2 (rural)	42	14.7
>200 per km^2 (urban)	243	85.3
Age (y), mean ± SD, range	70.0 ± 4.9	65–84
Body mass index, mean ± SD, range	29.6 ± 5.0	16.9–53.0

and being of the opinion that their diabetes was under control reported a lower QOL.

The distribution of responses and the weights assigned to the impact ratings are shown in Table 4. Diabetes had the greatest impact on "freedom to eat" (mean impact rating: −1.5 ± 1.0) and the least impact on "people's reaction" (mean −0.4 ± 1.0). "Dependence on others" was rated as the most important (mean 2.5 ± 0.7), and "freedom to drink" was rated as the least important to them (mean 1.2 ± 1.0). After considering weighting, "freedom to eat" remained as the most (mean −3.2 ± 2.9) and "people's reaction" as the least (−0.8 ± 1.5) affected QOL domains, respectively.

The ADDQOL instrument includes five domains that respondents can choose not to score. If no answer is provided, the ADDQOL score is calculated without these domains. Respondents in this study showed less interest in working life (the "not available" [NA] response was 76.5%) and sex life (the NA response was 54.0%) domains (Table 4). NA responses are important when the reliability and construct validity of the ADDQOL instrument are considered. In our study, because of the high NA response in working life and sex life, reliability and instrument validity calculation was possible only on 17 domains. Even then, the sample size for reliability and construct validity was n = 180 because holidays, family life, and personal relationship domains in combination excluded n = 105 respondents. The reliability of the ADDQOL instrument according to Cronbach's alpha was 0.91 (weighted impact score). For validation purposes, we used factor analysis with forced one-factor solution. This condition was imposed because the ADDQOL was intended to provide a single summary score [21]. In the forced one-factor solution, all domains with the exception of "freedom to drink" had factor loadings of more than 0.4. Freedom to drink loaded with a value of 0.285 into this factor. The forced one-factor solution explained 48.8% of the total variance.

Table 2 – Health characteristics.

	N = 285	%
Duration of diabetes mellitus (y)		
≤4	51	17.9
5–10	73	25.6
≥11	161	56.5
Hypertension	225	78.9
High cholesterol	170	59.6
Poor eye vision	26	9.1
Kidney dialysis	0	0.0
Foot amputation	8	2.8
Brain stroke	23	8.1
Heart attack	39	13.7

Discussion

This study provides detailed information about diabetes-dependent QOL and its assessment among older patients with DMT2 in Slovenia by using the ADDQOL, which is a widely used diabetes-specific scale in the literature [21–25,32,33]. To the best of our knowledge, the current study is the first to measure the HRQOL of older patients with DMT2 in Slovenia. Weighted ADDQOL domain scores reliability was similar to that in previous studies [26,27,32]. Structure validity results supported the one-factor scale structure of the ADDQOL, and the "freedom to drink" domain was calculated as the only possible domain that may not contribute to the ADDQOL instrument. The forced one-factor solution explained 48.8% of the total variance, which was also similar to that in previous studies [27,34]. The findings of the present study highlight the impact of DMT2 on QOL. An interesting finding in the current study was that a few patients report no impact of DMT2 on their QOL at all. In the rest, however, particular emphasis was put on the impact of "freedom to eat," "dependency on others," and "family life." Consistent with earlier studies [22–24,28,32], we found that the greatest negative impact observed was for the domain "freedom to eat," indicating the strong influence of dietary restrictions on the QOL. Similarly, the least affected domain was "people's reaction." Relative to the overall negative effects of diabetes on the QOL, the effect of specific sociodemographic and clinical factors was fairly modest [25,31].

The results in the present study show that lower QOL was significantly connected to the presence of additional health problems (i.e., heart attack). Other studies show that the influence of comorbidities or health complications in diabetes-dependent QOL seems unclear. Collins et al. [25] measured the amount of diabetes complications and concluded that the increased number did not result in lower QOL. Similarly, in Chung et al. [26], increased microvascular complications showed no association. Conversely, in Wang and Yeh [27], complications resulted in lower QOL, yet comorbidities provided no association. In concordance with Collins et al. [25], the study presented here provided no association of demographic data on diabetes-dependent QOL. Wang and Yeh [27], however, concluded that more education has negatively affected the QOL, and Chung et al. [26] found a positive association between older age and higher QOL. In the study presented here, we also measured the influence of diabetes duration on the QOL and found no association, which was in concordance to the results of Wang and Yeh [27].

Respondents who reported that they managed their disease well and have it under control showed a decreased likelihood of lower QOL, which suggests the importance of self-management

Table 3 – Predictors for lower QOL according to the ADDQOL score (prediction model: χ^2: 48.697, $df = 22$, $P < 0.001$).

	ADDQOL score		Wald χ^2	OR (95% CI)	P
	Higher ≥−3.0 n = 213 (in %)	Lower <−3.0 n = 72 (in %)			
Living in rural areas (≤200 /km^2)	12.7	20.8	2.38	1.96 (0.83–4.63)	0.123
Female	49.8	40.3	1.54	0.66 (0.34–1.28)	0.215
Age (y)					
65–74 (old)	72.3	75.0		1.00 (ref)	
75–84 (old-old)	27.7	25.0	0.32	0.81 (0.38–1.71)	0.573
Body mass index					
<25	13.1	13.9		1.00 (ref)	
≥25–<30	50.7	43.1	1.99	0.48 (0.14–1.12)	0.156
≥30	36.2	43.1	1.36	0.56 (0.21–1.48)	0.244
Education					
Primary education	29.6	33.3		1.00 (ref)	
Secondary education	57.7	55.6	0.01	0.96 (0.46–2.01)	0.922
College or higher	12.7	11.1	0.73	0.55 (0.14–2.16)	0.394
Monthly income (euro)					
≤365	11.3	16.7		1.00 (ref)	
366–730	56.8	56.9	0.28	0.78 (0.31–1.97)	0.598
731–1100	22.5	16.7	1.09	0.55 (0.17–1.70)	0.296
≤1101	9.4	9.7	0.22	1.46 (0.30–7.13)	0.639
Residence in own house	61.5	55.6	1.73	0.65 (0.34–1.24)	0.189
Single/divorced/widowed	32.9	33.3	0.02	1.05 (0.50–2.21)	0.888
Years of diabetes					
≤4	17.8	18.1		1.00 (ref)	
5–10	27.7	19.4	2.10	0.50 (0.20–1.28)	0.147
≥11	54.5	62.5	0.48	0.75 (0.33–1.69)	0.487
Hypertension	77.9	81.9	0.02	0.95 (0.44–2.02)	0.888
High cholesterol	56.8	68.1	2.24	1.64 (0.86–3.15)	0.134
Poor eye vision	7.0	15.3	3.61	2.53 (0.97–6.61)	0.057
Foot amputation	1.4	6.9	1.34	2.62 (0.51–13.38)	0.247
Brain stroke	9.4	4.2	3.23	0.28 (0.07–1.12)	0.072
Heart attack	11.7	19.4	4.53	2.42 (1.06– 5.20)	0.036
General health care satisfaction	82.2	76.4	0.10	0.89 (0.41–1.91)	0.757
Being of opinion to manage the disease	45.1	25.0	9.25	0.36 (0.18–0.69)	0.002

Note. Nagelkerke $R^2 = 0.215$.
ADDQOL, Audit of Diabetes-Dependent Quality of Life; CI, confidence interval; OR, odds ratio; QOL, quality of life.

of the disease [16,36–37]. In the present study, despite the fact that more than 50% of the patients have been living with DMT2 for 11 or more years, only 40% reported that they have their disease under control. This finding suggests that work is needed to increase patient empowerment and DMT2 self-management in Slovenia.

Open access to primary health care is ensured for all health care–insured individuals in Slovenia, in terms of both economic and geographical accessibility. Despite this, differences between regions in Slovenia have been reported, mainly due to an inadequate distribution in the number of primary health care personnel in some of the more remote rural areas, in which there can be a lack of doctors [38]. Therefore, we hypothesized that older patients with DMT2 living in rural areas would show a lower QOL than would patients living in urban areas. The present study, however, showed no connection with place of living and QOL. This finding, together with the finding of the parallel research on diabetes knowledge [39], implies that accessibility to chronic disease care provision and information does not depend on the place of living in Slovenia. This is in line with the European Health Interview Survey study [29,40], which implies that the use of primary care is relatively evenly spread across socioeconomic classes in Slovenia. In addition to the QOL, our results suggest that the older patients with DMT2 are satisfied with the delivery of care.

Although the research presented here shows no difference in QOL between rural and urban areas, this is not the same as saying that both groups receive high-quality care or that it cannot be improved. Health services should aspire to improve the QOL of older patients with DMT2. This is going to become an increasingly important issue as the prevalence and economic burden of diabetes among the Slovenian older population rises. A lack of critical assessment at a system level may hamper the attempt to improve the QOL. Hence, a well-translated and culturally adapted disease-specific HRQOL measure such as the ADDQOL could contribute to the more accurate assessment of the effectiveness of disease management programs.

Study Strengths and Limitations

The study gives an overview of the self-perceived QOL of older populations with DMT2. The main strength of the ADDQOL is that it measures the QOL in various areas of people's lives. This, however, can have a consequence that not all areas are applicable to all respondents. As a result, some respondents did not provide complete data for all ADDQOL domains, which may have

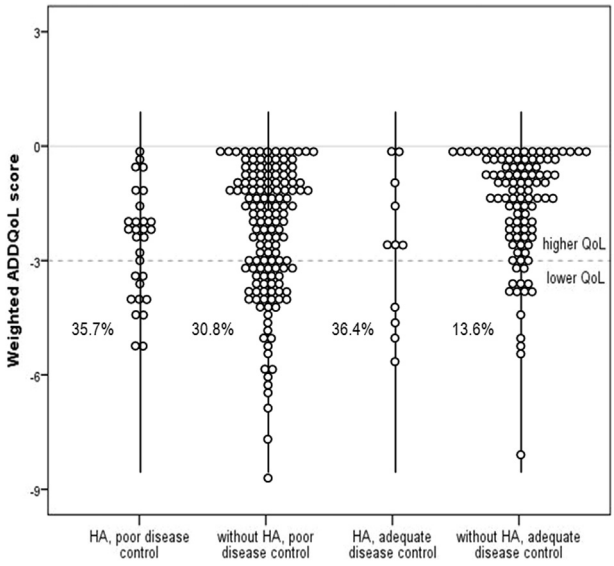

Fig. 1 – Percentage of patients in the lower ADDQoL quartile (<−3.0) according to heart attack (HA) status and their perception of disease control. ADDQOL, Audit of Diabetes-Dependent Quality of Life; QOL, quality of life.

introduced unintended biases into the analyses. The reason for the low response rate of the item "working life" might be a reflection of the fact that all the responders were aged 65 years or older and mainly retired.

The lack of a randomized sampling and use of a convenience sampling limit the ability to generalize the results. Because of patients' willingness to participate in the study, a response bias might have occurred. A larger sample would provide more power to detect significant relationships between study variables and differences between groups.

In the literature, we were not able to find many studies that researched the influence of various characteristics on diabetes-dependent QOL. Generally, all studies included demographic data and health problems together with some specific characteristics of their research interest; in our case, this was urban or rural living area. Among demographic data, age and gender were used always; other data such as education, marital status, or employment (income) were used optional. Health problems were presented as sum variables called complications and once separately as complications and comorbidities. In our study, we decided to show the influence of some complications and comorbidities by displaying the exact type of the disease (e.g., hypertension, heart attack, and brain stroke). This can provide an added insight that the existing literature is missing and lead to improved diabetes-dependent QOL knowledge.

Conclusions

The results of the current study are similar to findings in prior research conducted in other countries. This study also demonstrates that many of the factors related to diabetes-dependent HRQOL are applicable regardless of the country and health care system.

DMT2 is of growing public health concern in Slovenia. It imposes a personal burden on individuals and consumes a significant portion of society's scarce health care resources. Information on the QOL of older patients with diabetes is therefore important to Slovenian policymakers and health workers. It is essential in helping to identify and implement appropriate

Table 4 – Distribution of response (N = 285) by impact and importance rating together with weighted impact score.

Domain	Not available response (%)	Mean ± SD		
		Impact rating	Importance rating	Weighted impact score
Leisure activities		−1.1 ± 1.0	1.9 ± 0.7	−2.2 ± 2.2
Working life	218 (76.5)	−1.4 ± 1.0	2.1 ± 0.7	−3.0 ± 2.8
Journeys		−1.3 ± 1.0	1.8 ± 0.8	−2.5 ± 2.5
Holidays	98 (34.4)	−1.1 ± 1.0	1.8 ± 0.8	−2.0 ± 2.3
Physical health		−1.2 ± 1.0	1.9 ± 0.7	−2.5 ± 2.4
Family life	8 (2.8)	−0.9 ± 0.9	2.4 ± 0.6	−2.3 ± 2.5
Friendship and social life		−0.9 ± 1.0	2.0 ± 0.8	−1.9 ± 2.5
Personal relationship	74 (26.0)	−0.8 ± 1.0	2.3 ± 0.7	−1.9 ± 2.4
Sex life	154 (54.0)	−1.1 ± 1.0	1.8 ± 0.9	−2.3 ± 2.7
Physical appearance		−0.7 ± 0.9	1.5 ± 0.9	−1.4 ± 2.1
Self-confidence		−0.8 ± 1.0	2.0 ± 0.7	−1.8 ± 2.4
Motivation		−0.9 ± 1.0	1.9 ± 0.7	−2.0 ± 2.6
People's reaction		−0.4 ± 0.7	1.5 ± 0.9	−0.8 ± 1.5
Feelings about future		−1.1 ± 1.0	1.9 ± 0.7	−2.5 ± 2.5
Financial situation		−0.6 ± 0.9	2.0 ± 0.7	−1.3 ± 2.2
Living conditions		−0.9 ± 0.9	2.1 ± 0.7	−2.0 ± 2.5
Dependence on others		−0.6 ± 0.9	2.5 ± 0.7	−1.5 ± 2.3
Freedom to eat		−1.5 ± 1.0	1.8 ± 0.9	−3.2 ± 2.9
Freedom to drink		−0.9 ± 1.0	1.2 ± 1.0	−1.5 ± 2.3

Notes. Impact rating (conditions without diabetes): −3, very much better; −2, much better; −1, a little better; 0, the same; +1, worse.
Importance rating: 0, not at all important; 1, somewhat important; 2, important; 3, very important.
Weighted impact score = impact rating (−3 to +1) × importance rating (0–3) = −9 (maximum negative impact of diabetes) to +3 (maximum positive impact of diabetes).

interventions for achieving the better management of diabetes and ultimately improving the QOL of patients with diabetes.

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